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Magnetic properties of CaRuO_3

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Perovskite ruthenates ARuO_3 ($A=\text{Ca}$ and Sr) have an orthorhombic crystal structure with metal-like conductivity. SrRuO_3 exhibits a ferromagnetic transition with a Curie temperature of about 160 K. Though CaRuO_3 has been known as a paramagnet, a recent paper showed the possible existence of a spin-glass at low temperatures [1]. In this work, we have performed DC magnetization and AC susceptibility measurements to reveal further details of its magnetic properties. The samples were prepared by solid-state reaction in air. DC magnetization and AC susceptibility measurements were carried out using a SQUID magnetometer (Quantum Design, MPMS). Magnetization measurements showed the deviation between field-cooled and zero-field-cooled curves below about 80 K, and magnetic hysteresis at 4.5 K as in Ref. [1]. Relaxation of magnetization measured at 6 K indicated that magnetization changed with logarithmic time dependence, as seen in spin-glasses. AC susceptibility-temperature curves showed slight inflection around 80 K. Though a susceptibility peak is plausibly expected at a freezing temperature if the system becomes a spin-glass, such a phenomenon has not been clearly observed between 4.5 and 300 K.

[1] I. Felner et al, Phys. Rev. B62, 11332 (2000).